Completed Project (2012 - 2014)

Core Flight Software Project

Advanced Exploration Systems Program | Human Exploration And Operations Mission Directorate (HEOMD)

ABSTRACT

The AES Core Flight Software (CFS) project purpose is to analyze applicability, and evolve and extend the reusability of the CFS system originally developed by Goddard Space Flight Center into the realm of human-rated and next-generation human exploration space systems, thus enabling lower cost and rapid access to space. It will be demonstrated to run on the Avionics Architecture for Exploration testbed.

The results from thie project are being incorporated into the AES Avionics and Software project.

ANTICIPATED BENEFITS

To NASA funded missions:

A common set of software services and interfaces will speed development, reduce costs, allow easier upgrade, and improve redundancy of human-rated, software-based systems.

To NASA unfunded & planned missions:

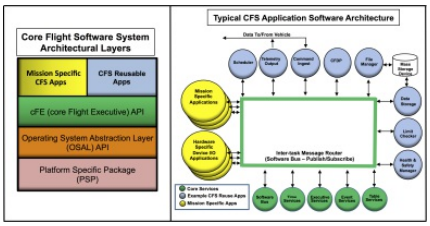
A common set of software services and interfaces will speed development, reduce costs, allow easier upgrade, and improve redundancy of human-rated, software-based systems.

To the nation:

A common set of software services and interfaces will speed development and reduce costs of human-rated, software-based systems for human exploration of space.

DETAILED DESCRIPTION

The mission of the CFS project is to provide reusable software in support of human space exploration programs. The top-level technical approach to individual deliveries in this project is two-phased – first prototype, then productize. The nominal plan is for every product to have some informal prototyping prior to delivery to evaluate whether the CFS architecture layers



Core Flight Software (CFS)

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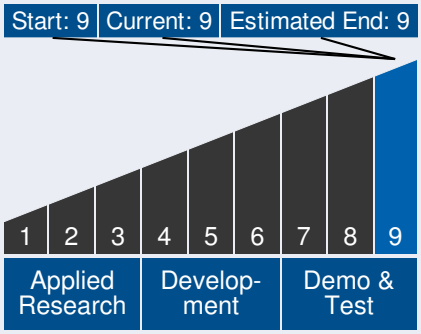
Technology Maturity



Management Team

Program Director:

- Jason Crusan

Program Executive:

- Richard Mcginnis

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properly over different topologies or a different application. Once deemed viable, and a working prototype is demonstrated, a CFS release can be moved into production. Several of these phases will likely be performed in parallel for different products.

Prototypes will be performed on the target platform, topology, or environment in which it will be used. Once demonstrated, the prototype will become productized.

The productization approach will vary based upon intended use and criticality of the product being produced, and follow NPR 7150.2A accordingly. An assessment of the product will be performed and an appropriate software classification and safety criticality will be identified. For products intended for public use, but not necessarily used in safety-critical applications, a less formal process will be required. For human-rated applications, existing Goddard Class B software will be assessed for changes needed to comply with NASA's Class A (human-rated) certification and the changes identified will be implemented. Software products intended for human spaceflight will be developed in accordance with NPR 7150.2B and adhere to CMMI level 3 processes. A software development plan and associated requirements, design, and test documents will be written for each product or suite of products. The software development plan will identify the elements to be produced for that product, the level of testing for the product, among other things.

Management Team *(cont.)*

Project Manager:
- Lorraine Prokop

Technology Areas

Primary Technology Area:
Communications, Navigation, and Orbital Debris Tracking and Characterization Systems (TA 5)
- Position, Navigation, and Timing (TA 5.4)
  - Onboard Auto Navigation and Maneuver (TA 5.4.2)
    - Onboard Trajectory Planning and Optimization Algorithms (TA 5.4.2.3)

Secondary Technology Area:
Modeling, Simulation, Information Technology and Processing (TA 11)
- Information Processing (TA 11.4)
  - Science, Engineering, and Mission Data Lifecycle (TA 11.4.1)
    - Onboard Data Capture and Triage Methodologies (TA 11.4.1.4)

Human Exploration Destination Systems (TA 7)
- Cross-Cutting Systems (TA 7.6)

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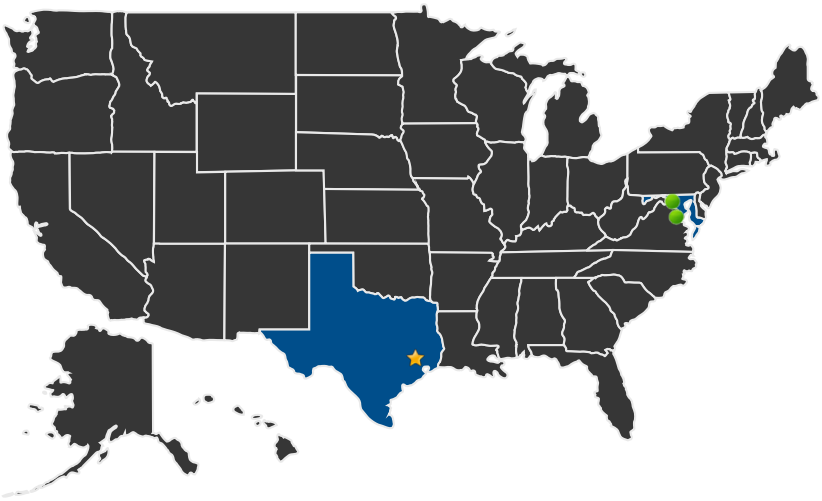
U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Johnson Space Center

Supporting Centers:

- Goddard Space Flight Center
- NASA Headquarters

Technology Areas *(cont.)*

Modeling, Simulation, Information Technology and Processing (TA 11)
- Computing (TA 11.1)
  - Flight Computing (TA 11.1.1)
    - High Performance Flight Software (TA 11.1.1.3)

DETAILS FOR TECHNOLOGY 1

Technology Title

Core Flight Software

Technology Description

This technology is categorized as an operating system for manned spaceflight

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Capabilities Provided

A common set of core flight software and services for human rated systems.

Potential Applications

CFS project resuilts will be used as part of avionics and software core services in human exploration systems. This technology will allow for easy avionics hardware changes and upgrades plus the ability to move software between dissimilar processors. It can be used by any mission desiring these capabilities.